



SHUSAKU YAMAMOTO

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U.S. Patent Application S.N. 09/846,297
Attorney Docket No. 0717-0465P

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

KUMATA, et al.

Serial No.: 09/846,297

Filing Date: May 02, 2001

For: OMNIAZIMUTHAL VISUAL SYSTEM

Examiner: C. D. Nguyen

Group Art Unit: 2675

DECLARATION UNDER 37 CFR §1.132

Date: Oct. 15, 2003, 2003

Assistant Commissioner for Patents

Washington, DC 20231

Dear Sir:

I, Kiyotoshi MISAWA hereby declare and state the following:

1. That I am a citizen of Japan, residing at 12-4-1, Minami-Kamo-Dai, Kamo-cho, Soraku-gun, Kyoto-fu, Japan 619-1127. I graduated with a Masters degree in engineering from University of Kobe in March, 1974. I graduated with a Doctoral degree from University of Osaka in March, 1977. I joined Sharp Kabushiki Kaisha in April, 1977. I was promoted to manager of the Product Development Department Integrated Circuits Group in June 1998. I was later promoted to Division Deputy General Manager of the CCD Division, which is my current position.

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2. That I have read the specification and fully understand the concept of the invention and recognize the scope of the pending claims;

2A. That I have reviewed the Office Action of April 25, 2003 and the references cited and the allegations made by the Examiner;

2B. That I have studied and fully understand the controls of the Zimmerman, Juday and Nobutoshi references; and

2C. That as a result of my study and review, I conclude as follows:

3. That Zimmermann discloses a fisheye lens having a 180° field of view (col. 3, lines 26-28). It is not capable of obtaining an image of 360° field of view, as claimed in independent claim 1.

4. That Zimmermann also describes that the fisheye lens shows the contents of the environment of a hemisphere (see col. 4, lines 28-30 and col. 5, lines, 13-15), while the system of the present invention is capable of transforming the contents of almost an entire sphere.

5. That Zimmermann describes that "the fisheye lens has a 2π steradian field of view and the image it produces is a circle". It is well-known in the art that a 2π steradian field of view is half a sphere. Thus, the

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circular image produced by Zimmermann manifests from a hemispherical view.

6. That the fisheye lens of Zimmermann requires nonlinear operations for image transformation (see page 4, lines 1-6 of the present specification and col. 5, line 54 to col. 7, line 54 of Zimmermann). It is therefore not capable of central projection transformation.
7. That Zimmermann cannot therefore teach an image transformation section for transforming the image data of the 360° view field area.
8. That Zimmermann explicitly teaches that only a portion of interest may be transformed (col. 4, lines 16-19).
9. That by using an optical system capable of central projection transformation, the present invention uses only linear operations and does not require storage of intermediate results, unlike Zimmermann which uses a fisheye lens that requires storage of intermediate results.
10. That since Zimmermann uses a fisheye lens, complex mathematical operations are required in order to transform the hemispherical image into a corrected image (see col. 5, line 54 to col. 7, line 54). If a person skilled in the art were to substitute the teachings of Judy, as contended by the Examiner to teach linear

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operations, then this would destroy the operability of Zimmermann.

11. That although the image of Zimmermann can be rotated through 360° (col. 4, lines 53-54) as pointed out by the Examiner, the actual fisheye lens is not rotated (see abstract) and thus cannot retrieve images from behind the lens.

12. That Juday teaches that a collective processor multiplies each incoming pixel by a weighting factor, stored in a factor look-up table, and places it in a new output address (see col. 7, lines 6-9 and lines 16-18). That is, although Juday includes a look-up table, the function of this look-up table is the provision of weighting factors to be used to achieve the remapping of two-dimensional video images. Juday does not teach or suggest a look-up table of a trigonometric function which is used to achieve transformation of polar coordinates to rectangular coordinates. Thus the teachings of Juday do not make up for the deficiencies in Zimmermann.

13. That Juday is directed to a general purpose programmable remapper that works with input preferably from a conventional video camera. The transformations that the programmable remapper performs are from one Cartesian matrix to another Cartesian matrix. Juday does not disclose performing coordinate transformation based on circular image data from an optical field of view of 360°.

14. That neither Zimmermann nor Juday teach an arithmetic/logic circuit for performing coordinate transformation of a polar coordinate when the image data

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is transformed into the display data as a rectangular coordinate with reference to a lookup table of a trigonometric function. That is, none of the cited references teach using specific hardware in order to achieve a polar to rectangular image transformation using a look-up table of a trigonometric function, as claimed in pending claim 1.

15. That furthermore, a person skilled in the art would not be motivated to combine Zimmermann and Juday, as contended by the Examiner, since Juday relates to a remapper for video images that works with conventional video camera, rather than an omniazimuthal visual system. Juday is not concerned with the transformation of an image of 360° view field area, as claimed in independent claim 1.

16. That a person skilled in the art would not be motivated to firstly change the software disclosed in Zimmermann to use the specific hardware claimed in claim 1, and then secondly include the look-up table of a trigonometric function for performing coordinate transformation, as described in claim 1.

17. That, regarding dependent claim 4, it is clearly described in the present specification that all image transformations are carried out only with linear operations (see page 40, line 23 to page 41, line 13 of the present specification). It is further recited that in the case of using a wide-angle lens (e.g., fisheye lens), an image transformation requires nonlinear operations in addition to trigonometric functions.

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Therefore, the fisheye lenses used by Zimmermann clearly is not capable of carrying out the functions of the device of the presently claimed invention (see col. 5, line 54 to col. 7, line 54 of Zimmermann, for example).

18. That Nobutoshi discloses a reflection mirror having the shape of one hyperboloid out of hyperboloid of two sheets and a lens having the other hyperboloid shape. However, Nobutoshi does not teach or suggest that a rotation axis of the hyperboloidal mirror is identical with an imaging axis of an imaging lens included in the imaging system as claimed in claim 5. Nobutoshi actually discloses a mirror which is used in conjunction with a conventional camera such that a picture picked up by the camera can be converted and processed in a conventional manner. Nobutoshi does not disclose or suggest that the mirror may be rotated. A person skilled in that art would not be motivated to combine Zimmermann with Nobutoshi.

19. That it is declared by the undersigned that all statements made herein of undersigned's own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, U.S. Code 1001 and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

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Oct. 15, 2003

DATE

Kiyotoshi Misawa

SIGNATURE (Kiyotoshi MISAWA)